COMPARISON OF BOVINE TRANSFER FACTOR AND MICOTIL®: EFFECTS ON HEALTH AND PERFORMANCE OF RECEIVING HEIFERS

S. P. Montgomery, J. S. Drouillard, M. A. Greenquist, J. J. Sindt, W. F. Miller, J. N. Pike, E. J. Good, E. R. Loe, M. J. Sulpizio, and T. J. Kessen

Summary

Transfer factors are antigen-specific products of T lymphocytes that are capable of transferring delayed-type hypersensitivity and cell-mediated immunity. We evaluated bovine transfer factor (TF) for use in receiving cattle. Crossbred beef heifers (n = 665) initially weighing 495 lb were used to determine the effects of TF on the health and performance of beef cattle during a 36-day receiving period. Heifers were processed within 24 hours after arrival. Treatments were subcutaneous injection with 1.5 ml of Micotil®/100 lb of body weight or oral administration of 700 mg of TF isolated from bovine colostrum. Heifers given TF during initial processing received an additional 700 mg/day of TF in the diet on days 2 through 5. The percentage of heifers treated at least one, two, or three times for bovine respiratory disease (BRD) was greater (P<0.01) for heifers given TF than for heifers given Micotil (72.5 vs. 47.1; 31.5 vs. 14.7; and 18.0 vs. 4.2, respectively). There were no differences between TF and Micotil with respect to dry matter intake, weight gain, or gain efficiency of heifers. Subsequent in vitro fermentations indicated that TF protein is readily degraded by ruminal microbes. Oral administration of TF was not as effective as Micotil injection in decreasing BRD in receiving cattle.

Introduction

Bovine respiratory disease (BRD) is the leading cause of morbidity and mortality in feedlot cattle. Treatment for BRD in feedlot cattle generally uses antibiotic therapy, which fosters public concern about antibiotic usage in livestock. Transfer factors are products of T lymphocytes, seem to consist entirely of protein, and are rather small. Transfer factors are antigen specific and possess the ability to transfer delayed-type hypersensitivity and cell-mediated immunity from an individual previously exposed to a specific antigen to a naïve recipient; but data is lacking about effects of oral administration of transfer factors in functional ruminants.

The objective of our experiment was to compare oral administration of transfer factors with the antibiotic Micotil as a prophylactic treatment against BRD in receiving cattle. We also characterized degradation of transfer factor protein by ruminal microbes in vitro.

Experimental Procedures

Experiment 1. A total of 665 crossbred beef heifers initially weighing 495 lb was used in a completely randomized design to determine the effects of bovine transfer factor (TF) on the health and performance of beef cattle during a 36-day receiving period. Heifers were processed within 24 hours after arrival, and processing included measurement of body weight, vaccination against common viral and clostridial diseases (Bovishield® 4 and Fortress® 7, respectively), recording of rectal temperature, and treatment for internal and external parasites (Phoenectin®). In addition, heifers received either a subcutaneous injection of 1.5 ml of Micotil/100 lb of body weight or received 50 ml of a solution consist-

ing of water and 28 grams of a commercially available source of TF isolated from bovine colostrom (Livestock Stress Formula™). The TF solution was administered orally via dose syringe to provide 700 mg of actual TF. Immediately after initial processing, heifers within each treatment were assigned randomly among 28 pens. Pens contained 21 to 27 heifers each, depending upon pen size, with 14 pens per treatment. Heifers given TF during initial processing received an additional 28 grams of Livestock Stress Formula daily in the diet as a top dress on days 2 through 5. Heifers were subsequently monitored for clinical signs of BRD, including depression, lethargy, anorexia, coughing, rapid breathing, and nasal or ocular discharge. Heifers exhibiting signs of BRD received antibiotic therapy consisting of Micotil as a first-time and second-time treatment for BRD, and Liquamycin® LA-200® and dexamethasone as a third-time treatment for BRD. The number of times heifers were treated for BRD ranged between zero and three. Heifers were offered a common receiving diet for ad libitum consumption once daily (Table 1). At the end of the 36-day receiving period, heifers were weighed.

Table 1. Diet Composition for Experiment 1 (% of Dry Matter)

Ingredient	% of Dry Matter
Steam-flaked corn	44.0
Alfalfa hay	45.0
Corn steep liquor	6.0
Soybean meal	3.8
Salt	0.4
Potassium chloride	0.2
Vitamin/trace mineral premix[a]	0.6
Chemical composition, analyzed	
Dry matter	81.5
Crude protein	17.0

[a]Formulated to provide the following (dry matter basis): 1,500 IU/lb vitamin A, 20 IU/lb vitamin E, 0.1 ppm cobalt, 10 ppm copper, 0.63 ppm iodine, 60 ppm manganese, 0.3 ppm selenium, 2 ppm iron, and 60 ppm zinc.

Experiment 2. In vitro incubations of rumen fluid alone (control), with casein, or with TF were conducted. Whole rumen contents were obtained from two ruminally cannulated steers fed a diet containing (dry matter basis) 76% steam-flaked corn, 10% alfalfa hay, 3% soybean meal, 1.2% urea, 5% cane molasses, and 4.8% of a mineral vitamin premix offered for ad libitum consumption. Ruminal contents were strained through two layers of cheesecloth, and mixed with buffer, and 200 ml of the rumen fluid/buffer mixture were added to flasks containing no added protein (control) or containing 40 mg of nitrogen from either casein or Livestock Stress Formula. Flasks were incubated for 1.5 hours at 102°F, and a 1-ml sample from each flask was collected every 30 minutes. Products of protein degradation were measured in the resulting samples. Twelve flasks were used, providing four replications per treatment.

Results and Discussion

Experiment 1. Heifers that received Micotil during initial processing required fewer first-time, second-time, and third-time treatment for BRD ($P<0.01$) compared with heifers receiving TF (Table 2), suggesting that Micotil was more effective as a prophylactic treatment against BRD than TF. The percentage death loss for heifers receiving Micotil was 1.1% and for those receiving TF was 1.0%; this was not different between treatments.

Treatment did not affect dry matter intake, average daily gain, or gain efficiency of heifers during the receiving period (Table 2), in spite of differences in the percentage of heifers treated for BRD.

Experiment 2. Rate of in vitro protein degradation was greater for TF than for casein (Figure 1). Casein is commonly used as a standard for measuring protein degradability, and it is rapidly and extensively degraded by ruminal microbes. The TF protein was degraded at a greater rate than casein, indicating

that TF protein is rapidly degraded by ruminal microbes. Degradation of TF protein by ruminal microbes might have contributed to the failure of TF to protect against BRD as effectively as Micotil in our experiment.

The results of these experiments suggest that orally administering TF as a prophylactic treatment against BRD in cattle is not as effective as prophylactic medication with Micotil, possibly because of extensive degradation of TF protein by ruminal microbes.

Table 2. Treatment Incidence for Bovine Respiratory Disease (BRD), Percentage Death Loss, and Growth Performance of Newly Arrived Heifers After Prophylactic Treatment with Either Micotil® or Bovine Transfer Factor

Item	Micotil	Transfer Factor	SEM	P-value
No. of pens	14	14	-	-
No. of heifers	333	332	-	-
Initial body weight, lb	493	495	6.2	0.71
Final body weight, lb	594	596	11.2	0.88
Treatments for BRD, % of heifers				
at least one	47.1	72.5	3.6	<0.01
at least two	14.7	31.5	3.5	0.01
three	4.2	18.0	2.3	0.01
Death loss, %	1.1	1.0	0.57	0.88
Dry matter intake, lb/day	12.5	12.3	0.37	0.73
Dry matter intake, % of body weight daily	2.31	2.26	0.05	0.47
Daily gain, lb	2.79	2.77	0.19	0.92
Gain:feed	0.220	0.221	0.011	0.95

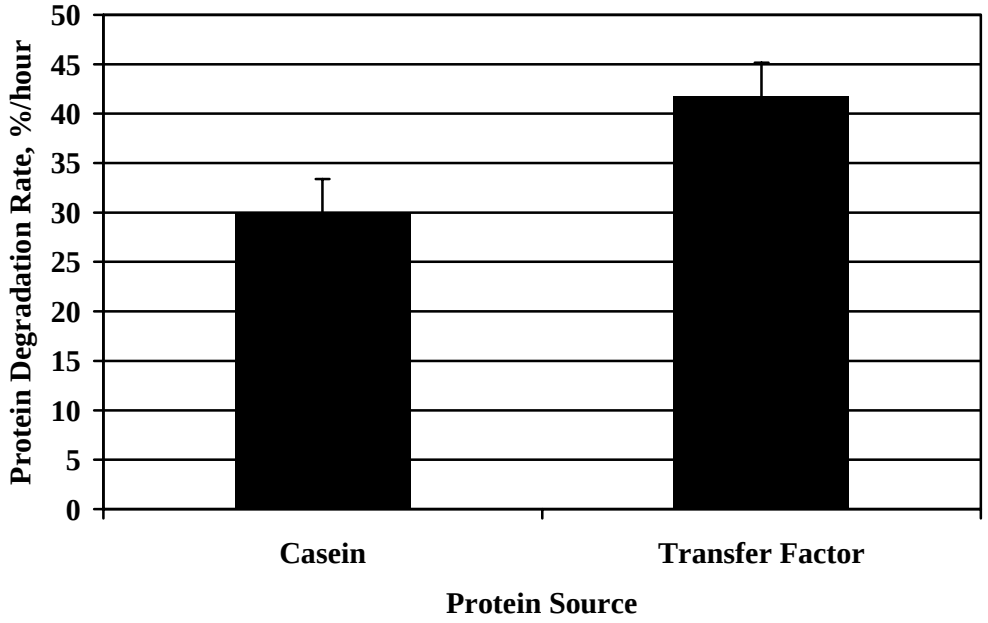

Figure 1. Rates of In Vitro Protein Degradation. Effect of protein source (P<0.05).